BLANKOM®

Professional Headend Solutions

Operating instructions

QAM Modulator

ASI-TS → DVB-C/ ITU-T J.83 Annex B, C

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AMB 406

Part Nº: 9850.02

1. Safety and operating instructions

When assembling, starting-up and adjusting the modules, it is necessary to consider the system specific references in the manual instruction!

The modules may only be installed and started up by authorized technical personnel!

When assembling the modules into the receiving points, the adherence of the EMC regulations is to be secured!

The assembly and wiring have to be done without voltage!

All active modules may only be operated with the Headend Controller HCB x00 or Bus Extender BEB x00!

The main voltage and the operating voltage of the modules working by DC have to be in complience to the operating parameters described in the technical data.

With all work the defaults of the DIN EN 50083 have to be considered! Especially the safety relevant execution of the DIN EN 60728-11[3] is necessary!

2. Device variants

AMB 406	9850.02	ASI TS → DVB-C/ ITU-T J.83 Annex B, C

Mininum software requirements for HCB x00:

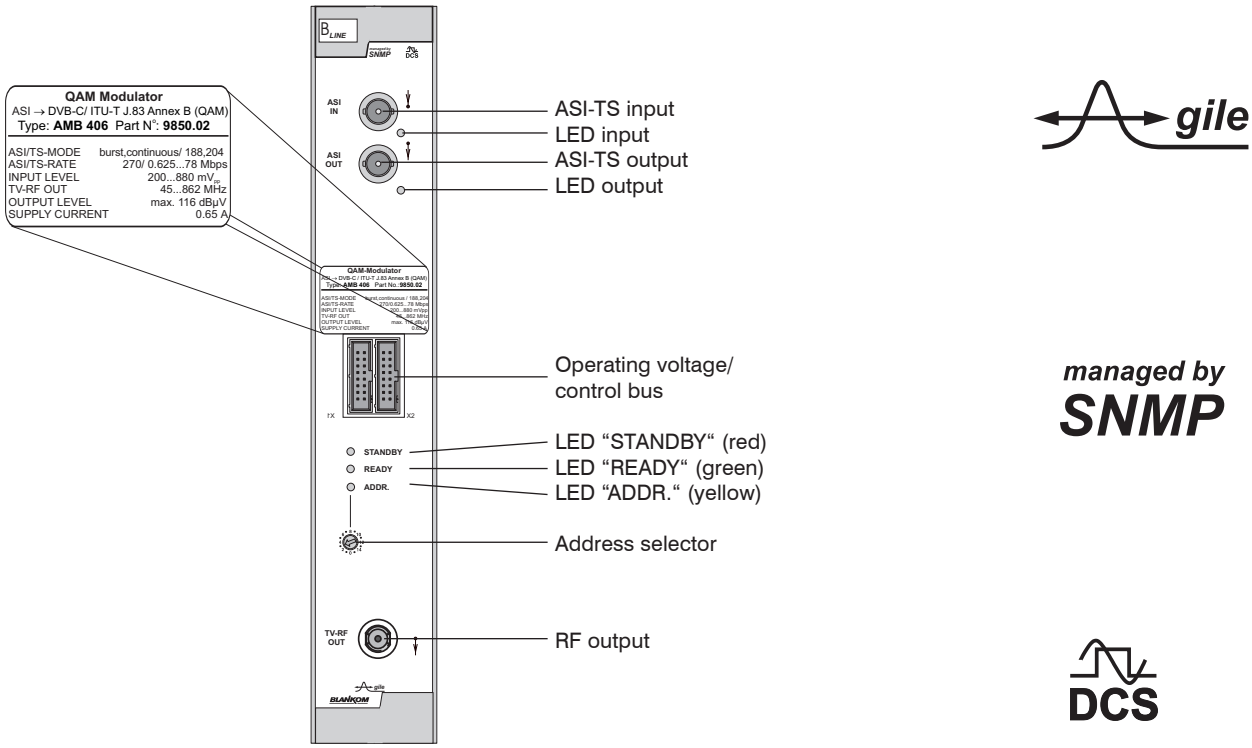
9650.03:	Version 2.34*
9650.04/.05:	Version 3.18*
9652.01:	Version 3.18*
9653.01:	Version 3.27*
9653.02:	Version 3.28*

*) Updates: www.blankom.de

3. General

The QAM Modulator AMB 406 is a module of the head end system B-LINE wich is conceived as a complete system for middle-sized networks.The module converts one digital transponder into the digital cable standard DVB-C or ITU-T J.83 Annex B or C. The signal will be transcoded from the ASI transport stream into cable TV channels. All modules will be programmed via a central control unit (HCB x00) and are working fully independent afterwards. The status of the modules are displayed via LED's (see chapter 7.2 "Status LEDs").

4. Front view



5. Functional description

The data stream which results from the ASI input is passed to a FIFO. All services of the resulting transport stream which shall be processed into the QAM modulator will be choosen by controling software of the module. The SI and PSI tables affected (i.e. the PAT, PMT, SDT, EIT) are automatically corrected. The Headend Controller serves to generate an NIT (Network Information Table) into the transport stream. This is required to enable the receiver (such as Set-Top-Box) to tune in automatically. The changed SI an PSI tables are fed into the QAM modulator and an IF signal is generated at the output channel. There is a free choise of frequency in the output channel from 45 to 862 MHz. On the output side, the modulator does not leak to adjacent channels. So that errors in level can be signalled if the load fluctuates (the red LED will flash and a trap message will be sent), a reference level is generated. Every time the level for frequency figures are programmed, automatic measurement of the refence level takes place; this function will, however, not start until 100 seconds have elapsed after start-up of the system. This function can be enabled or disabled in the main menu.

6. Adjustments

6.1 Adjustment with the Headend Controller

- Adjustment of the addresses at the Bus Extender BEB x00 and at the modules
- Activation of the programming mode on each module by selecting the line (BEB x00) and the module position (01... 15) at the Headend Controller (HCB x00) → yellow LED illuminates until the beginning of the parameter adjustment
- Adjustment of the AMB 406 parameter (see chapter 9) → green LED is switched on
- After the programming the AMB 406 will be automatically switched into the operating mode → yellow LED flashes shortly/ green LED is switched on

6.2 Adjustment with PC/ laptop

- Prerequisite for the remote programming is an "online-connection" according the IP standard and an ethernet connection at the PC/ laptop
- Adjustment of the line/ position addresses at the Bus Extender BEB x00 as well as at the modules
- At the Headend Controller HCB x00 input provided IP address (default: 192.168.2.80)
- For "direct connection" between a PC and HCB x00 use a crossover cable (RJ 45)
- For connection over a HUB use a normal straight throught patch cable
- Start-up HTML browser and enter provided IP address as target address
- If connected correctly the web interface will be opened on the pc and a blue LED (LINK) at the HCB x00 will be lit up.
- All adjustments of the modules are specified on the web interface.

6.3 Adjustment with SNMP

- Prerequisite for the SNMP functionality is the use of HCB x00 with enabled SNMP software option CKB 100.
- Supported is SNMP version 1.0 [2].
- Automatic creation of the MIB based on the current head end configuration by the HCB x00.
- For setting and reading out the parameters and is to receive traps from an SNMP management software required.

The manual instructions of the Headend Controller HCB x00 and the Bus Extender BEB x00 have to be considered!

· Further notes on the SNMP functionality of BLANKOM modules are listed in the SNMP manual (download: www.blankom.de).

7. Meaning of LED signals

7.1 LED's at the ASI ports

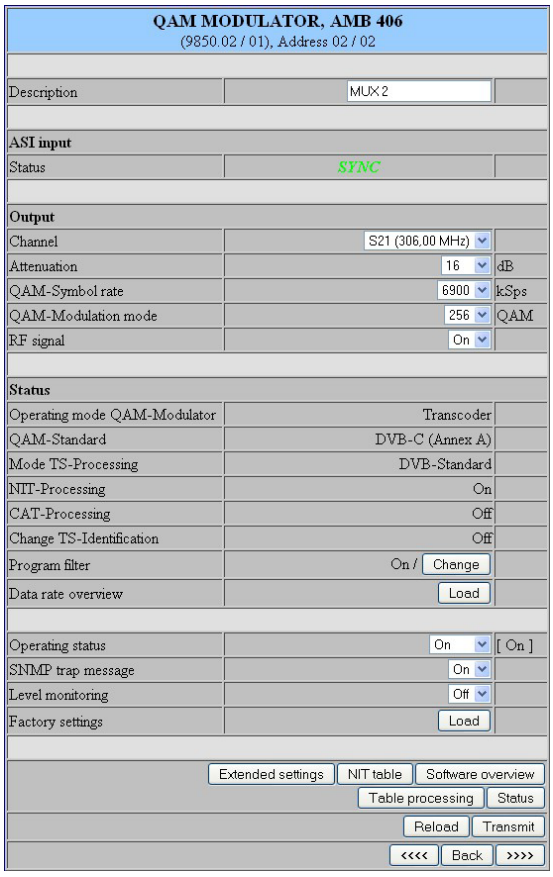
Colour	Status	Meaning of display
green	permanently on	ASI channel has been configured as input
	flashing	no ASI signal
yellow	permanently on	ASI channel has been configured as output
	flashing	no ASI signal

7.2 Status LED's

Designation (Colour)	Status	Meaning of display
STANDBY (red)	permanently on	Module is in standby
	flashing	Module faulty (hardware) or level error
READY (green)	permanently on	Module working, everything ok
	flashing	Dysfunction depending in signal: ASI not sync (e.g. in case of missing input signal) no input on the QAM modulator buffer overflow in the QAM modulator QAM overflow (input data rate on the QAM modulator too large)
	off	RF output is deactivated
ADDR. (yellow)	illuminated/ flashing	Remote control making contact / data transmission

8. Programming by web server*

8.1 Main menu



Name of device, item number, address in head end

Description — program name (max. 30 characters)

ASI input
Status — displays wether **SYNC**hronization or **noSYNC**hronisation with input

Output
Channel — channel selection (2 ... 69, standard B/G)
Attenuation — adjustment range 0 ... 31.5 dB
QAM-Symbol rate — selection: 6995, 6900, 6875, 6111, 6000, 3450, 1750 kSps
QAM-Modulation mode — selection: 16, 32, 64, 128, 256 QAM
RF signal — selection: On, Off

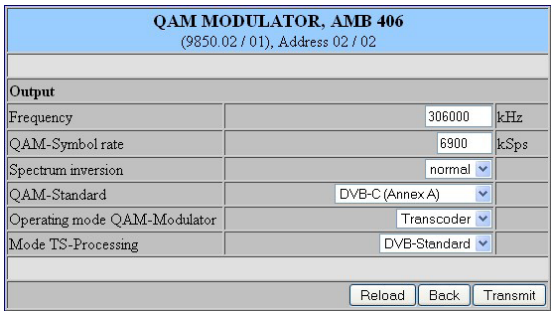
Status
Operating mode — according adjustment menu 1
QAM-Standard — DVB-C/ ITU-T J.83 B/ C acc. adjustment menu 1
Mode TS-Processing — DVB-Standard/ TNT-France according menu 1
NIT-Processing — On/Off according adjustment menu 2
CAT-Processing — On/Off according adjustment menu 2
Change TS-Identificat. — On/Off according adjustment menu 2
Program filter — On/Off according adjustment menu 5
Data rate overview — see menu 6

Operating mode — selection: On, Off, Reset
SNMP trap message — selection: On, Off, if SNMP option in HCBx00 enabled, otherwise „locked" display
Level monitoring — selection: On, Off
Factory settings — setting the default values (see menu 9)

Routing to the appropriate adjustment menu
Extended settings — see menu 1
NIT table — see menu 3
Software overview — see menu 8
Table processing — see menu 2
Status — see menu 7

* Further details on this are to be found in the HCB manual

8.2 Extended settings (menu 1)

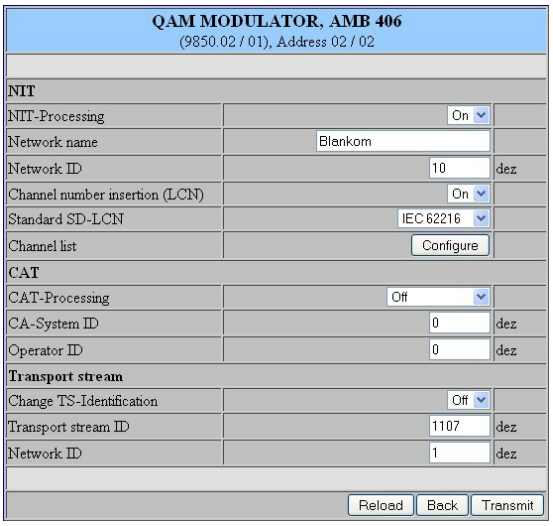


Name of device, item number, address in head end

Output

Frequency	adjustment range: 45000 ... 862000 kHz
QAM - Symbol rate	adjustment range: 1000 ... 7200 kSps
Spectrum inversion	selection: normal, invers
QAM-Standard	selection: DVB-C (Annex A), ITU-T/J.83B (Annex B), ITU-T/J.83C (Annex C)
Operating mode QAM-Modulator	selection: Transcoder, Testpegel, Testsignal
Mode TS-Processing	selection: DVB-Standard, TNT-France

8.3 Table processing (menu 2)



Name of device, item number, address in head end

NIT

NIT-Processing	selection: On, Off
Network name	freely selectable (max. 30 characters)
Network ID	adjustment range: 0 ... 65535
Channel number insertion (LCN)	selection: On, Off
Standard SD-LCN	IEC 62216, NorDig(V1)
Channel list	configuration see menu 4

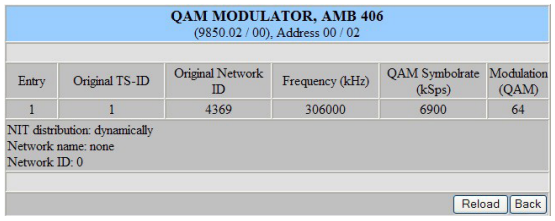
CAT

CAT-Processing	selection: On, On (CA Filter), Off
CA-System ID	adjustment range: 0 ... 65535
Operator ID	adjustment range: 0 ... 65535

Transport stream

Change TS-Identific.	selection: On, Off
Transport stream ID	adjustment range: 0 ... 65535
Network ID	adjustment range: 0 ... 65535

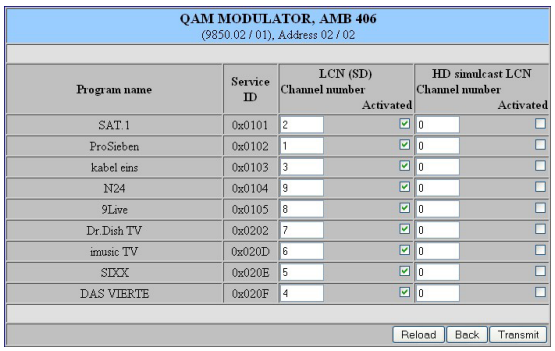
8.4 NIT table (menu 3)



Name of device, item number, address in head end

NIT table with all information available

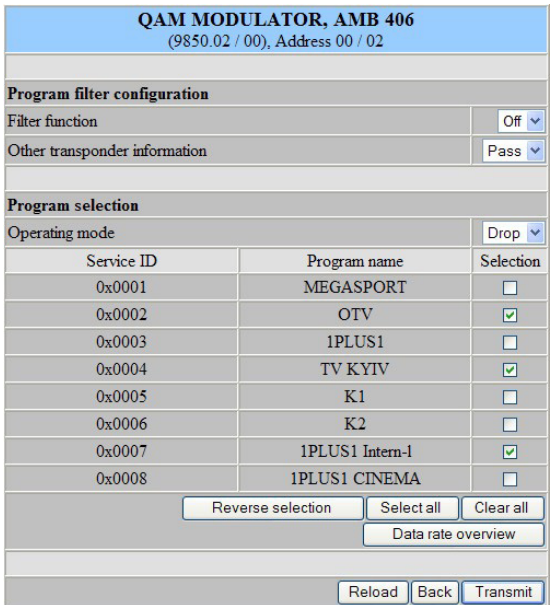
8.5 Configure channel list-LCN (menu 4)



Name of device, item number, address in head end

The allocation of a logical channel number (LCN) is a service that allocates a serial number to each TV activated program. If the set-top box supports this service at the subscriber, the TV programs are offered in the order established by program numbers. It should be noted that the numbering is done separately for HD and SD programs for the respective type of the box. The simultaneous activation and number allocation for SD-programs in the HD column provides such programs to the appropriate channel number in the program list for HD boxes.

8.6 Program filter (menu 5)



Name of device, item number, address in head end

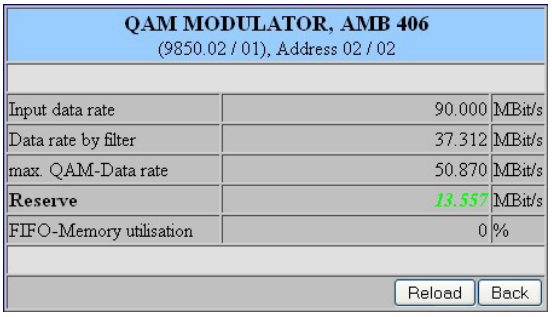
Program filter configuration

Filter function	selection: On, Off
Other transporder table	pass or drop of additional informations (e.g. electronic program guide), wich are contained in data stream as “other“

Program selection

Operating mode	pass or drop of the marked programs
Reserve selection	all not marked programs are choosen or vice versa
Select all	all programs of the list are marked
Clear all	no program of the list is marked
Data rate overview	routing to menu 6

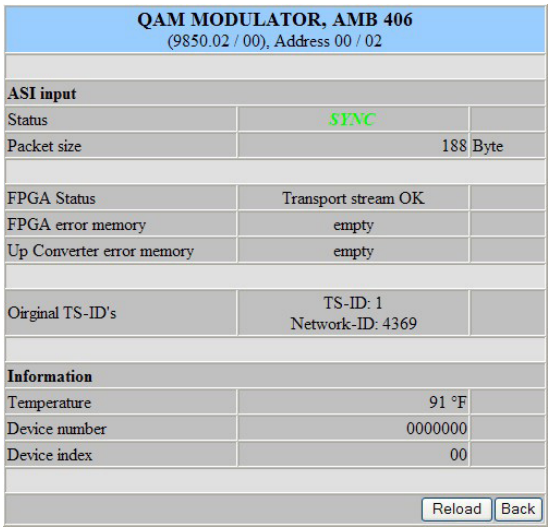
8.7 Data rate overview (menu 6)


QAM MODULATOR, AMB 406
(9850.02 / 01), Address 02 / 02
Input data rate 90.000 MBit/s
Data rate by filter 37.312 MBit/s
max. QAM-Data rate 50.870 MBit/s
Reserve 13.557 MBit/s
FIFO-Memory utilisation 0 %
Reload
Back

Name of device, item number, address in head end

Input data rate	net data rate at the input
Data rate by filter	net data rate by program filters
max. QAM Data rate	max. possible net data rate
Reserve	max. QAM data rate minus data rate by filter
FIFO-Memory utilisation	displays in %

8.8 Device status (menu 7)



Name of device, item number, address in head end

ASI input

Status	**SYNC**hroninsation or **noSYNC**hronisation with ASI input
Packet length	length of packets (188/204) in byte
FPGA Status	status, transport stream input
FPGA error memory	error memory TS Mux, QAM Mod.
Up Converter error memory	error memory up converter
Original TS-ID’s	display transport stream ID and network ID

Information

Temperature	Temperature of terminals board
Device number	display of the device number
Device index	display of the device index (hardware)

8.9 Software overview (menu 8)

QAM MODULATOR, AMB 406 (9850.02 / 00), Address 00 / 02	
Version	
AP Controller	9850.02-81.01 Steuercontroller Anschluss-LP V1.05 18.02.2009 JR
FPGA Bootcontroller	9859.81-88.01 FPGA Boot Controller(2) V1.03 16.10.08 JR
FPGA	9859.81-87.01 TS-Mux;QAM-Modulator V1.05 13.01.2009 WE,JR
Nios	9859.81-90.01 TS-Manager V1.04 20.02.2009 JR
ASI-Bootcontroller	9850.02-88.01 FPGA Download Controller V1.35 08.09.2008 MF,PK
ASI-FPGA	9850.02-87.01 ASI Input FPGA V1.43f 21.10.2008 WE,MF
Up Converter	9199.01-88.02 internal Controller V2.00 26.06.2008 JH
Back	

Name of device, item number, address in head end

Software version

Controller of the front circuit board

FPGA-Bootcontroller

QAM modulator, TS-Mux (FPGA)

TS-Manager

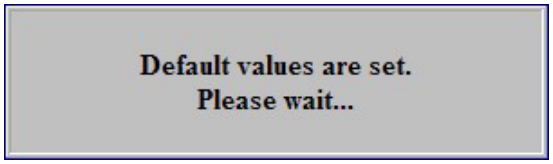
ASI-Bootcontroller

ASI-FPGA

Up Convertrer controller

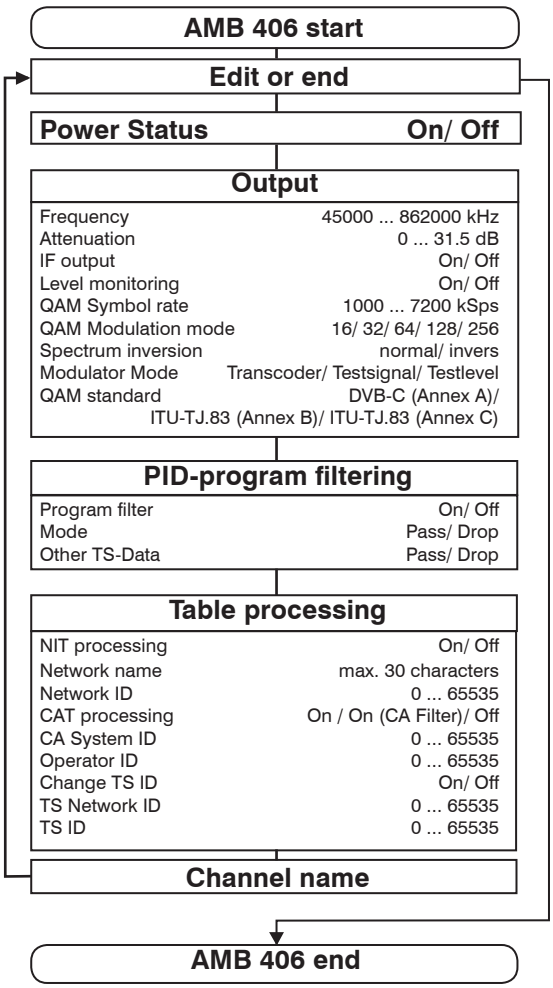
8.10 Factory settings (menu 9)

When request this menu item at first a security query whether it really set all parameters to the factory default settings pops up.



Affirming the query, all settings made on the EEPROM will be deleted and replaced by the default settings. The modul will go back to these default values. Once the setting process is over, there will be automatic return to the main menu. It takes about one minute.

9. Menu control with Headend Controller (HCB x00)

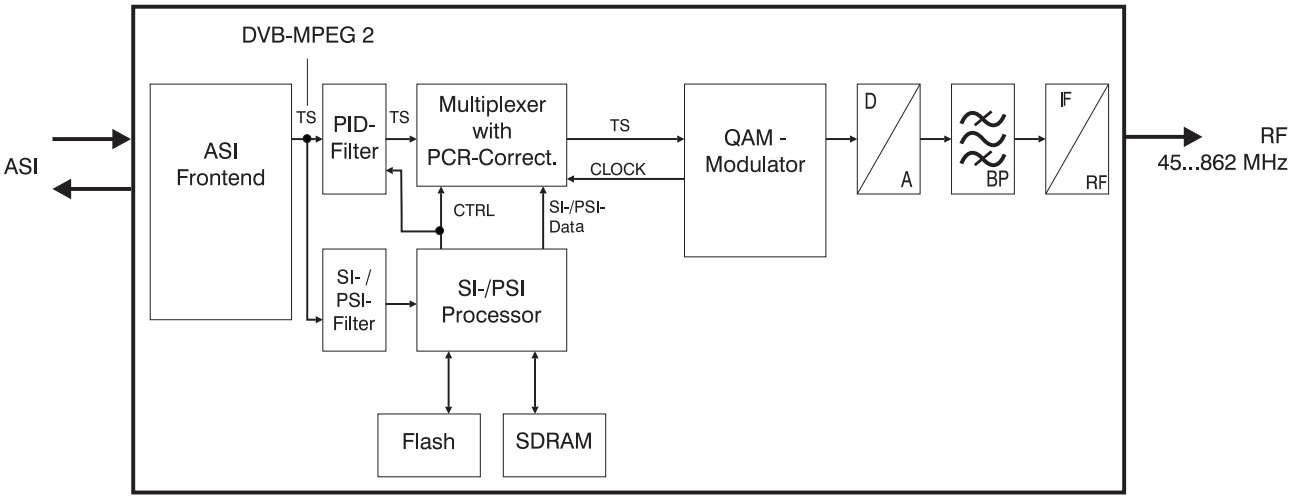

AMB 406 start
Edit or end
Power Status On/ Off
Output
Frequency 45000 ... 862000 kHz
Attenuation 0 ... 31.5 dB
IF output On/ Off
Level monitoring On/ Off
QAM Symbol rate 1000 ... 7200 kSps
QAM Modulation mode 16/ 32/ 64/ 128/ 256
Spectrum inversion normal/ invers
Modulator Mode Transcoder/ Testsignal/ Testlevel
QAM standard DVB-C (Annex A)/ ITU-TJ.83 (Annex B)/ ITU-TJ.83 (Annex C)
PID-program filtering
Program filter On/ Off
Mode Pass/ Drop
Other TS-Data Pass/ Drop
Table processing
NIT processing On/ Off
Network name max. 30 characters
Network ID 0 ... 65535
CAT processing On / On (CA Filter)/ Off
CA System ID 0 ... 65535
Operator ID 0 ... 65535
Change TS ID On/ Off
TS Network ID 0 ... 65535
TS ID 0 ... 65535
Channel name
AMB 406 end

10. Trap messages

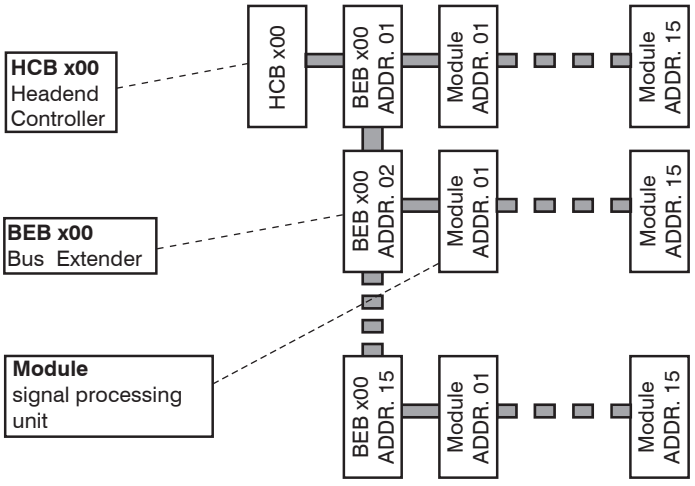
Item	Message	Message type	Explanation
01	Power fail	CRITICAL	short circuit
02	System Reset	WARNING	reset by internal error
03	Signal OK	INFORMATION	module works correctly
04	Tuner not sync	WARNING	no input signal at the tuner
05	IIC error	CRITICAL	IIC-Bus-error
06	TS-MUX not sync	WARNING	no transport stream at the FPGA
07	Internal controller reset	WARNING	error when accessing internal controller
08	FPGA: Program memory full	WARNING	overflow of program memory in the FPGA
09	FPGA: PID memory full	WARNING	overflow of PID memory in the FPGA
10	FPGA: Directory full	WARNING	overflow of Directory in the FPGA
11	FPGA: FAT memory full	WARNING	overflow of FAT memory in the FPGA
12	FPGA: TS-Packed buffer overflow	WARNING	overflow of TS-Packet buffer
13	QAM overflow	CRITICAL	overflow of QAM
14	Sync error data FIFO	CRITICAL	data FIFO doesn't work correctly
15	No response to OPEN command	CRITICAL	error internal port

Item	Message	Message type	Explanation
16	Up Converter: PLL1 not locked	CRITICAL	no funktion at the PLL 1 converter
17	Up Converter: PLL2 not locked	CRITICAL	no funktion at the PLL 2 converter
18	Up Converter: IF input too small	WARNING	IF input too small at the Up converter
19	Up Converter: IF input too large	WARNING	IF input too large at the Up converter
20	Up Converter: RF output too small	WARNING	RF output too small at the Up converter
21	Up Converter: RF output too large	WARNING	RF output too large at the Up converter

11. Block diagram

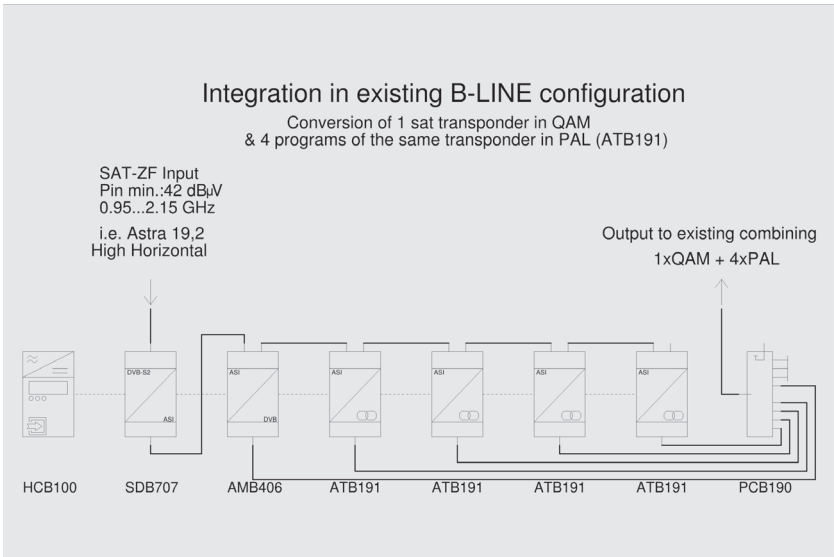


12. Head end bus structure



The number of the possible module connections (00 ... 15) to a BEB x00 depends on the total power consumption of this line!

13. Application example



14. Technical data

ASI input

Level range	200 … 880 mV_{pp}
System clock	270 Mbps
Connector	BNC socket
Impedance	75 Ω
ASI polarity	regular/ inverted

ASI output

Level	800 mV_{pp} (± 10 %)
System clock	270 Mbps
Connector	BNC socket
Impedance	75 Ω
ASI polarity	regular

ASI signal processing

Data rate	0.625 … 213 Mbps
ASI transfer format	
Input	continuous, burst
Output	burst
TS transfer format	
Input	188, 204 Byte
Output	188, 204 Byte
Signal processing	EN 50083-9 [1]

QAM modulator

Input data rate			max. 78 Mbps according adjustment symbol rate & QAM constellation
Symbol rate			1.0 ... 7.2 MSps
QAM Modulation			ITU-T J.83 Annex B, C, DVB-C
	Annex B	**Annex C**	**DVB-C**
QAM Constell.	64; 256	64	16; 32;64; 128; 256
Roll off	12 %, 18 %	13 %	15%
Interleaving	Conv. I=128, J=4	Conv. I=12	Conv. I=12
Forward error correction (FEC)	Reed Solomon (128,122) + Trellis	Reed Solomon (204, 188,8)	Reed Solomon (204, 188,8)

Test signals	according adjustment symbol rate & QAM constellation
Measurement signal	unmod. carrier (signal level)
PSI-/SI processing	disconnectable
Zero stuffing	continously
Signal processing	EN 300 429 [2] (DVB-C) ITU-T J.83[4] (Annex B, C)

RF Output

Output frequency range	45 ... 862 MHz
Tuning step	125 kHz
Max. output level	116 dBµV
Level adjustment range	0 ... 31.5 dB (0.5 dB steps)
Channel allocation	adjacent channel ability
Connector	F socket
Impedance	75 Ω
Return loss	≥ 18 dB 45 MHz - 1.5 dB/ Octave

Signal quality

MER	≥ 45 dB
Shoulder attenuation	≥ 58 dB
Spurious 45 ... 862 MHz	≥ 60 dB
C/N (> 25 MHz space from channel center)	
BW = 4.8 MHz	typ. 80 dB
BW = 6 MHz	typ. 79 dB
BW = 8 MHz	typ. 78 dB
Phase noise	1 kHz; typ. -92 dBc/ Hz 10 kHz; typ. -101 dBc/ Hz 100 kHz; typ. -108 dBc/ Hz
Max. frequency stability	± 30 kHz
Output level stability	± 0.5 dB
Amplitude frequency response channel (8 MHz)	max. 1 dB_{pp}

Operating parameters

Voltage/ current	12 V (± 0.2 V)/ max. 650 mA
Residual ripple of the supply voltage	≤ 10 mV_{PP}

Enviromental conditions

Temperature range	-10 ... +55 °C
Temperature range for data keeping	5 ... 45 °C
Relative humidity	≤ 80 % (non condensing)
Mounting method	vertical
Mounting location	splash-proof and drip-proof

Physical information

Dimensions (w x h x d)	
without 19" adapter	50 x 276 x 148 mm
with 19" adapter	50 x 301 x 148 mm
Weight	1,190 g

Delivery content 1 x bus connector

15. Glossary

ASI	**A**synchronus **S**erial **I**nterface
AP	**A**nschluss**p**latte (front circuit board)
BW	**B**and**w**idth
CA	**C**onditional **A**ccess
CAT	**C**onditional **A**ccess **T**able
DVB	**D**igital **V**ideo **B**roadcasting (-C Cable, -S Satellite, -S2 Satellite 2, -T Terrestrial)
EIT	**E**vent **I**nformation **T**able
ETSI	**E**uropean **T**elecommunications **S**tandards **I**nstitute
FAT	**F**ile **A**llocation **T**able
FEC	**F**orward **E**rror **C**orrection
FIFO	**F**irst **I**n – **F**irst **O**ut
FPGA	**F**ield **P**rogrammable **G**ate **A**rray
HTML	**H**yper**t**ext **M**arkup **L**anguage
HTTP	**H**yper**t**ext **T**ransfer **P**rotocol
I/Q	**I**n-phase/**Q**uadrature-phase
ID	**Id**entifier
IF	**I**ntermediate **F**requency
IIC	**I**nter-**I**ntegrated **C**ircuit (I^2C-Bus, data bus within device)
IP	**I**nternet **P**rotocol
LED	**L**ight **E**mitting **D**iode
MAC	**M**edia **A**ccess **C**ontrol
MER	**M**odulation **E**rror **R**atio
MIB	**M**anagement **I**nformation **B**ase
MPEG	**M**oving **P**icture **E**xperts **G**roup
NIM	**N**etwork **I**nterface **M**odule
Nios	product name for a processor
NIT	**N**etwork **I**nformation **T**able
PAT	**P**rogram **A**ssociation **T**able
PCR	**P**rogram **C**lock **R**eference
PID	**P**rogram **Id**entifier
PMT	**P**rogram **M**ap **T**able
PSI	**P**rogram **S**ervice **I**nformation
QAM	**Q**uadrature **A**mplitude **M**odulation
RF	**R**adio **F**requency
SDT	**S**ervice **D**escription **T**able
SI	**S**ervice **I**nformation
SNMP	**S**ingle **N**etwork **M**anagement **P**rotocol
TS	**T**ransport **s**tream

16. Bibliography

[1] EN 50083-9: Cabled distribution systems for television, sound and interactive multimedia signals, part 9: Interfaces for CATV/SMATV head ends and similar professional equipment for DVB/MPEG-2 transport streams

[2] EN 300 429: Digital Video Broadcasting (DVB): Framing structure, channel coding and modulation for cable systems

[3] EN 60728-11: Cable networks for television signals, sound signals and interactive services Part 11: Safety (IEC 60728-11:2005); German version EN 60728-11:2005

[4] ITU-T J.83 Digital Multi-Programm-Systeme für Fernseh-, Ton-und Datendiensten für Kabel-Verteilung, Änderung von Anhang B und C (2006)

[5] RFC 1157 Request for Comments (RFC): RFC Database URL: Http://www.rfc-editor.org/rfc.html

17. History

Version	Date	Modification	Author
1.00	25.11.2009	basic dokument	Häußer, Rudolph
1.01	03.02.2009	revision	Rudolph, Häußer
1.02	27.07.2011	revision web sites	Häußer
1.03	19.06.2015	new company	Häußer

Options and other TV standards available upon request! Changes due to technical progress possible!

CE Declaration of Conformity

Manufacturer:	BLANKOM systems GmbH Hermann – Petersilge – Straße 1 07422 Bad Blankenburg Germany
Product Name:	QAM-Modulator
Type Name:	AMB 406
Type Nº:	9850.02

BLANKOM systems GmbH confirms that the mentioned products meet the guideline(s) of the Council for the approximation of legislation of the member states.

Electromagnetic compatibility (2004/ 108/ EC)
The following standards are met: DIN EN 50083-2: 2007-04 (EN 50083-2:2006-06)

Low voltage guideline (2006/ 95/ EC)
The following standards are met: DIN EN 60950-1: 2006-04 (EN 60950-1:2006-11)
Information technology equipment -Safety-

Restriction of hazardous substances (2011/ 65/ EC)
The following standards are met: DIN EN 50581: 2013-02 (EN 50581:2012)

Bad Blankenburg, Germany, 2015-06-19

Wolfgang Schlüter
(Managing Director)